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(54) Abstract Title

Atomic layer deposition method

(57) In a method of forming a thin film using an atomic layer deposition (ALD) method, a thin film is formed on a substrate in a cycle of injecting a first reactant including an atom that forms the thin film and a ligand into a reaction chamber that includes the substrate, purging the first reactant, injecting a second reactant into the reaction chamber, and purging the second reactant. The thin film is formed by a chemical reaction between the atom that forms the thin film and a second reactant whose binding energy with respect to the atom that forms the thin film is larger than the binding energy of the ligand with respect to the atom that forms the thin film and the generation of by-products is prevented. The generation of a hydroxide by-product in the thin film is suppressed by using a material that does not include a hydroxide as the second reactant, purging the second reactant, and reacting the second reactant with a third reactant that includes hydroxide. After purging the second reactant, the third reactant for removing impurities and improving the stoichiometry of the thin film is injected and purged. By doing so, it is possible to obtain a thin film, which does not include impurities and whose stoichiometry is excellent. The dangling bond of the surface of the substrate is terminated by injecting oxidising gas before injecting the first reactant when the first reactant is $\text{Al}(\text{CH}_3)_3$ the second reactant is O_3 , O_2 , or N_2O . When the first reactant is a metal, the second reactant is N_2O , O_2 , O_3 , or CO_2 , and the third reactant is an oxidising gas.

FIG. 3

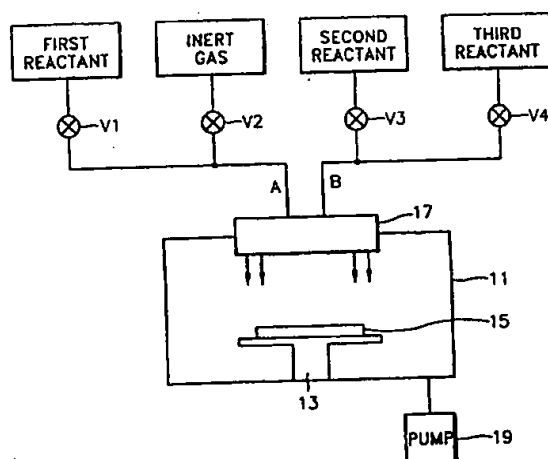
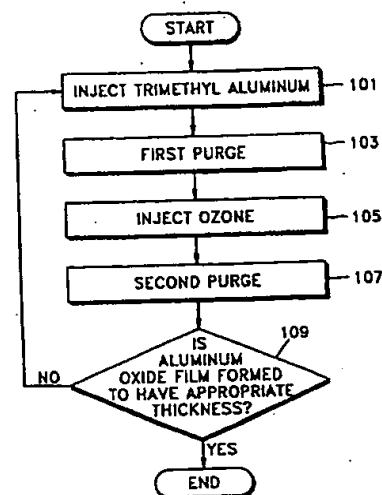


FIG. 5



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